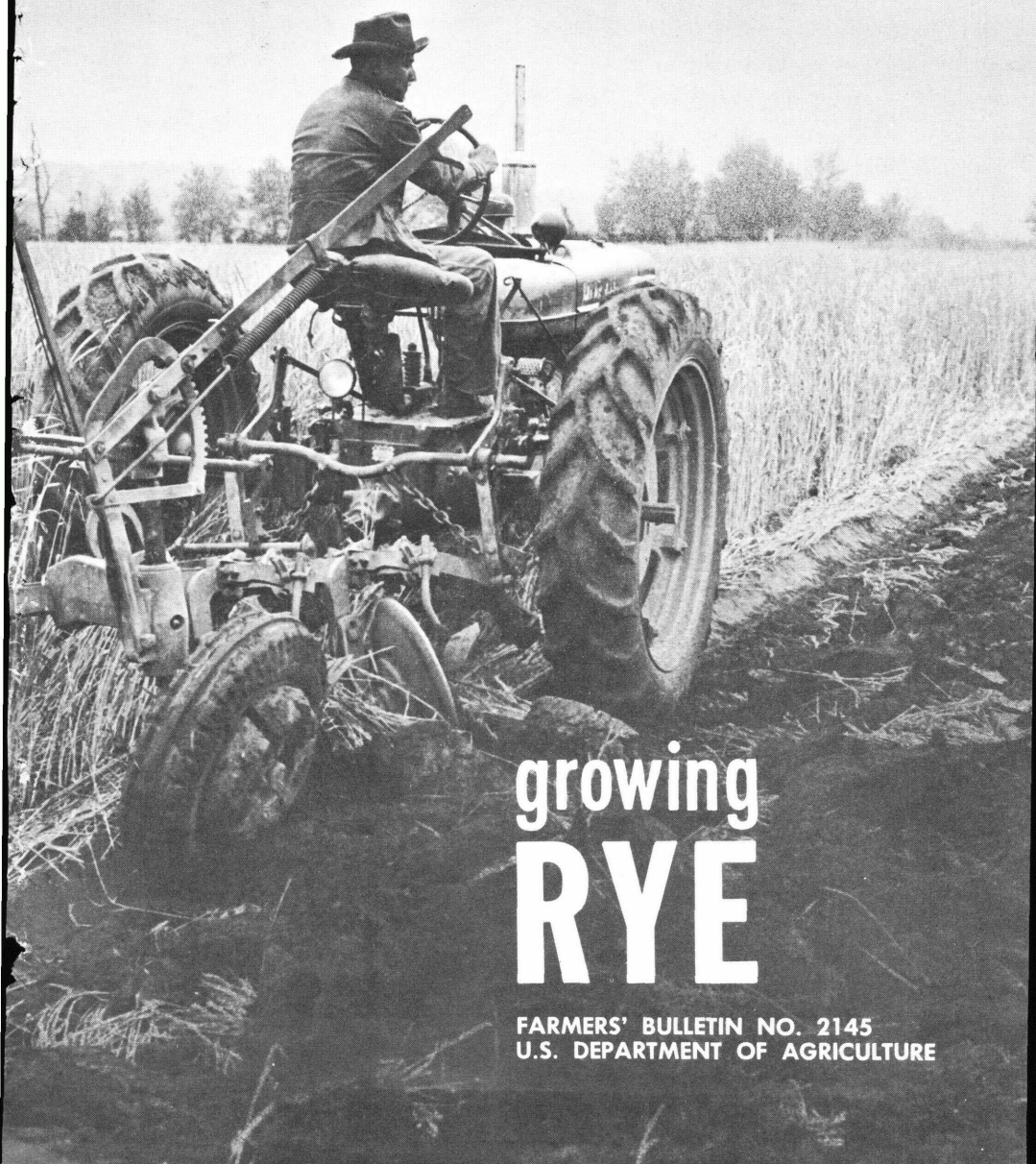
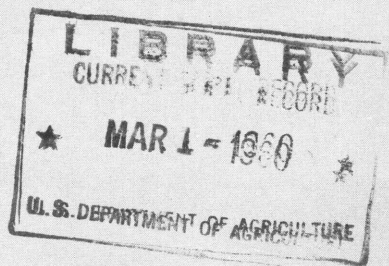


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growing RYE

FARMERS' BULLETIN NO. 2145
U. S. DEPARTMENT OF AGRICULTURE

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Washington, D.C.

Issued December 1959

growing RYE

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cultural Research Service.*

Rye is a versatile crop. It is harvested for hay, grain, and silage, and is used for pasture or as a cover, green-manure, or companion crop.

Rye can produce crops in many areas where soil and climate are unfavorable for higher income crops. It may be planted later in the fall than other small grains because it has a shorter germination period under low temperatures; it grows quickly; and it is cold hardy.

The greatest concentration of rye acreage in the United States is in the Plains States, where it is grown primarily as a grain crop. In the East South Central and South Atlantic States it is grown for pasture or for a cover or green-manure crop more generally than it is for grain.

ADAPTATION

Rye can be grown in every State, but acreage is limited in most areas

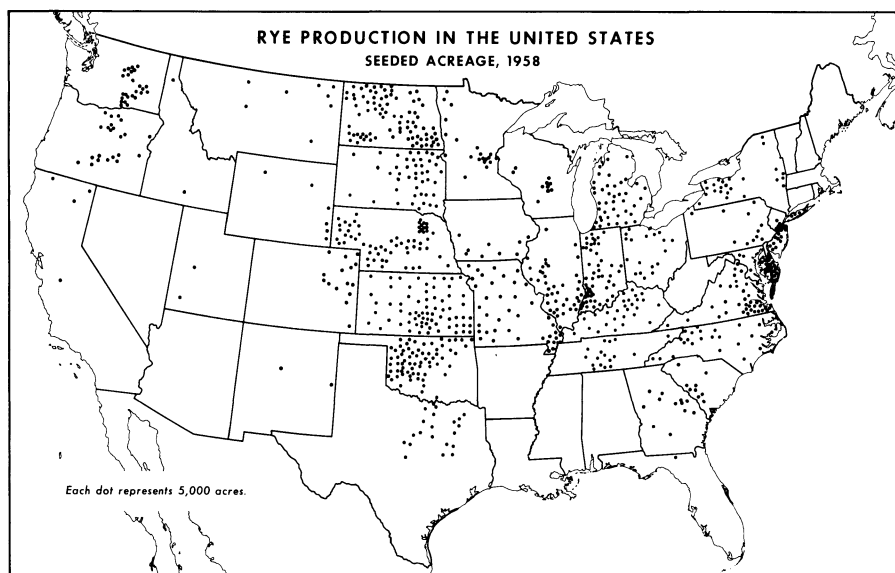
because other crops are more profitable.

Compared with other cereals adapted to the same area, winter rye generally is more winter hardy and is earlier in maturity.

Winter rye in its flowering stage may be damaged by frosts. Its early flowering may make it impractical as a grain crop in some of the western mountain valleys or in other places where late spring frosts are likely to occur.

The soil requirements of rye are not as exacting as those of other small grains. It is more productive on infertile, sandy, or acid soils than are wheat, oats, or barley. Rye often is the only small grain that can be grown successfully on sandy soils.

Rye produces better on light loams and sandy soils than on heavy clay soils. It is more tolerant of dry soils than of wet, poorly drained soils.



U. S. DEPARTMENT OF AGRICULTURE

AGRICULTURAL RESEARCH SERVICE

BN-8385

Distribution of winter rye planted for the 1958 crop year. Each dot represents 5,000 acres.

TYPES OF RYE

Two distinct types of rye are grown in the United States—winter rye and spring rye.

Winter rye must be sown in the fall if it is intended for a grain crop; it needs low temperatures during its dormant stage. If this “cold requirement” is not met, the plants will not head.

Some varieties of winter rye are adapted primarily in the South and others primarily in the North.

Varieties in the southern group are characterized by a low degree of winter hardiness and an upright habit of fall growth. Their cold requirement is met in areas having mild winters. In the areas where they are adapted, southern varieties are better than northern varieties

for pasture because they grow more rapidly during the fall and in mild winter weather.

Northern winter ryes are grown principally for grain. Winter hardiness and a prostrate form of fall growth are characteristic of these varieties. They need lower winter temperatures to satisfy their cold requirement than do southern varieties.

Spring rye matures quickly from spring sowing. It can be grown from fall sowing in areas where the winters are mild enough. Little spring rye is grown in this country.

VARIETIES

Some rye is known only as winter or common rye and some as spring rye. These generally are locally

adapted ryes with mixed characteristics of plant appearance and seed color.

The following list shows, by State, varieties commonly grown.

STATE:	Varities
California-----	Common, Merced, Kung.
Colorado-----	Balbo.
Delaware-----	Balbo, Abruzzi, Tetra- Petkus.
Florida-----	Abruzzi strains, Wrens Abruzzi, Gator, Flor- ida Black.
Georgia-----	Abruzzi strains, Wrens Abruzzi, Gator; Bal- bo in mountains.
Idaho-----	Rosen, Common, Tetra- Petkus.
Illinois-----	Balbo.
Indiana-----	Balbo.
Iowa-----	Balbo.
Kansas-----	Balbo.
Kentucky-----	Balbo.
Maryland-----	Abruzzi, Balbo.
Michigan-----	Balbo.
Minnesota-----	Adams, Caribou.
Missouri-----	Balbo.
Montana-----	Dakold, Rosen, Prolific.
Nebraska-----	Common, Balbo, Pierre.
New Jersey---	Balbo, Common, Tetra- Petkus.
New Mexico---	Balbo.
New York-----	Balbo, Tetra-Petkus, Rosen.
North	
Carolina-----	Abruzzi, Balbo.
North Dakota:	Antelope, Caribou, Da- kold, Pierre, White Soviet.
Ohio-----	Common, Tetra-Petkus, Balbo.
Oklahoma-----	Abruzzi, Balbo, Elbon, Tetra-Petkus.
Oregon-----	Common, Tetra-Petkus, Abruzzi.
Pennsylvania---	Balbo, Tetra-Petkus.
South	
Carolina-----	Abruzzi strains, Gator, Wrens Abruzzi.
South Dakota.	Antelope, Caribou, Pierre.
Tennessee-----	Balbo.
Texas-----	Common, Abruzzi.
Virginia-----	Abruzzi, Balbo.
Washington---	Common, Abruzzi, Tetra-Petkus.
Wisconsin-----	Adams, Imperial.

A list of varieties recommended for your area, with descriptions of each, is available from your State agricultural experiment station or your county agricultural agent.

Named varieties of rye usually differ from one another in kernel size, kernel color, plant height, and disease resistance. Typical characteristics of each variety are noted here. Not all plants of a variety conform to the general description; characteristics differ within a variety because rye is cross pollinated.

Winter Rye

SOUTHERN VARIETIES

Balbo, released in 1933 by the Tennessee Agricultural Experiment Station, is sufficiently winter hardy to be grown in some North Central States.

It is well suited for early seeding to provide fall pasture; it grows rapidly and is resistant to the hessian fly. It can provide fair grain yields, but its main use is for forage in the early fall and early spring.

The kernels of *Balbo* are medium size and of variable color.

Original seed stocks of *Balbo* were introduced from Italy.

Abruzzi is adapted to most of the Cotton Belt. It is used principally for grazing and for a cover crop. It grows vigorously and rapidly, even in cold weather.

Abruzzi (Abruzzes) was introduced from Italy in the early 1900's by the U.S. Department of Agriculture.

A number of strains have been

selected from Abruzzi. *South Georgia*, *Beech Island*, and *Florida Black*—similar strains of Abruzzi—are grown in Georgia and Florida. They are several days earlier than Abruzzi, are somewhat taller, and produce satisfactory grain yields. Their production of forage is greatest early in the season; they produce little forage after midwinter.

Kernels of these varieties are small and a high percentage of them are dark brown or black. Typical Abruzzi kernels are medium size and light brown.

Wrens Abruzzi, which was released about 1950 by the Coastal Plain Experiment Station, Tifton, Ga., is one of the earliest strains of Abruzzi. It is well adapted to the Coastal Plain and is hardy throughout the South. It has performed well in forage trials and in grain production trials. It has a semi-upright habit of growth.

Woods Abruzzi matures later than other strains of Abruzzi. It is winter hardy and has produced good grain and forage yields. It is best adapted to the Piedmont area of Georgia.

Abruzzi and strains selected from it have been grown in all the States south of a line extending from Oklahoma to Maryland. Some of the more northerly strains are semiupright in growth and produce good grain yields. However, these strains are not as useful for pasture or for cover crop as are the more southerly strains.

Gator is adapted to Florida and Georgia. It is a vigorous forage

producer that is medium in maturity. Most plants are resistant to leaf rust, stem rust, and powdery mildew. *Gator* seed characteristics resemble those of Abruzzi.

Gator was released by the Florida Agricultural Experiment Station in 1956. The variety was increased from a single disease-resistant plant.

Elbon was released by the Oklahoma Agricultural Experiment Station in 1956 to help fill the need for winter pasture from December to March. It heads 1 to 2 weeks earlier than Abruzzi and has larger kernels. It produced more winter growth in Oklahoma tests than either Abruzzi or Balbo.

The variety was selected and increased at the Samuel Roberts Noble Foundation, Ardmore, Okla.

Raritan, which was developed in New Jersey, resembles Abruzzi but is hardier and more productive. *North Carolina Winter*, *Virginia Winter*, and *French* are other varieties that are similar to Abruzzi.

NORTHERN VARIETIES

Dakold is adapted to the Northern Plains. It is very winter hardy and is early in maturity. It has small heads, slender stems, and small, dark-colored kernels. *Dakold* still is grown in North Dakota and Montana, but it has largely been replaced by varieties with higher yields. This variety was developed by the North Dakota Agricultural Experiment Station and released in 1902.

Dakold 23 was selected by the

University of Saskatchewan for improved winter hardiness. It is higher in yield than Dakold, medium in maturity, and high in test weight. It resembles Dakold in other characteristics.

Pierre, which was developed by the South Dakota Agricultural Experiment Station, is early in maturity and is very winter hardy; it is well adapted to the Northern Plains. It is similar in grain yield to other adapted northern varieties. Its kernels are medium in size, variable in color, and high in test weight.

Pierre is a synthetic variety developed from intercrossing a composite of 16 inbred lines selected from Dakold and Swedish rye. It was released in 1950.

Antelope, released by the University of Saskatchewan in 1953, is replacing Dakold in the Northern Plains. Antelope ripens at about the same time as Dakold. It has a denser spike, larger kernels, and a higher percentage of blue-green kernels than Dakold. Antelope exceeded Dakold in yield and winter survival in Canadian tests.

Antelope was developed by a combination of pedigree breeding and mass selection from a variety named Korm (Crown).

Caribou is a sister selection of Antelope. It was increased by the University of Minnesota and released in 1953. It is high in grain yield, medium in maturity, and is very winter hardy. It is adapted to the Northern Plains. Caribou has small seed that is variable in color and high in test weight.

Adams is a high-yielding rye of medium maturity. Its kernels are medium size and are light brown to amber. It is adapted to Minnesota and Wisconsin. Because of its lower degree of winter hardiness, it is not as well adapted to the Dakotas as are Antelope, Caribou, and Pierre.

Adams was released by the Wisconsin Agricultural Experiment Station in 1953. It is a combination of inbred lines from Imperial that were selected on the basis of plant vigor, disease resistance, and uniform kernel shape and color. It is similar to Imperial in appearance.

Imperial is grown in Wisconsin but it is being replaced by higher yielding ryes. It is of medium maturity. It is a little less winter hardy than Emerald, Caribou, and Pierre. Its kernels are medium size and uniformly light brown to amber.

Imperial originated at the University of Wisconsin. First released in 1929 as "White rye," its name was changed to Imperial about 1937.

Emerald, released by the University of Minnesota in 1943, is being replaced by the higher yielding varieties Adams and Caribou. Emerald is medium in maturity and medium in test weight. It is similar in winter hardiness to Pierre, Antelope, and Caribou. It was developed by selecting and recombining green-seeded lines of Minnesota No. 2 (Swedish).

White Soviet has been grown principally in the Dakotas. It is

being replaced by higher yielding varieties such as Antelope and Caribou. It is medium in maturity. Its kernels are medium large and light brown.

White Soviet is a Canadian introduction that was brought into the United States about 1940.

Rosen once was the leading rye in Michigan and other Northern States, but it has been replaced by newer varieties. Many of the northern ryes surpass *Rosen* in winter hardiness; it is only slightly more winter hardy than leading varieties of winter wheat.

Rosen is not adapted south of Kansas. In Kansas, it has no advantages over other varieties in grain or forage yield. It has given good results, however, in Iowa and Nebraska and in the subhumid sections of Idaho and Washington.

Rosen is rather late in maturity. It has heads that generally are large and well filled. Its kernels are rather large and are mostly dark green.

It was first distributed in 1912 by the Michigan Agricultural Experiment Station.

Tetra-Petkus was developed in Germany by treating ordinary *Petkus* rye with a drug. The drug—colchicine—caused internal changes to take place in the plant; the chromosome number doubled, making the plant a tetraploid. The new variety has large stems, leaves, and kernels. The kernels are almost twice the size of ordinary rye kernels and they are uniform in color. The plants are coarse and

vigorous; they do not lodge when grown on fertile soil.

This variety is best adapted to the Northeast and to Oregon and Washington; it is not winter hardy enough for the Northern Plains.

It is a high-yielding variety when grown isolated from other ryes, but in most areas it has not been any higher yielding than adapted local ryes.

Tetra-Petkus is a slow starter in the fall and spring compared to *Balbo* and *Abruzzi*; its use as a forage rye is limited. It is about 10 days to 2 weeks later in maturity than most other rye varieties. Its grain has a low test weight.

Tetra-Petkus requires an abundance of its own pollen to produce a good seed set. For grain production, isolate it from other ryes by a distance of at least 40 rods.

Kung is a Swedish rye that has been tested in Oregon and California. It is late in maturity. It has stiff straw and relatively large seeds. It needs low temperatures during its dormant stage to head properly.

Other varieties of northern rye include *Minnesota No. 2*, *Advance*, *Schlanstedt* (Wisconsin No. 2), *Ivanof*, and *Mammoth White*.

Spring Rye

Prolific, a true spring rye with an upright habit of growth, has been grown in Montana and adjacent States for many years. It is early in maturity. If it is sown in the fall, *Prolific* will survive only mild winter temperatures. It has medium-size, blue-green kernels.



IND. 20462

Early spring pasture is provided by a rye crop that was seeded the previous September in standing corn. The crop also furnished soil cover during the winter. It will be turned under for green manure before summer crops are planted.

Prolific was introduced from Germany by the University of Saskatchewan.

Merced was released by the California Agricultural Experiment Station in 1947. It is very early in maturity. In California tests, it grew much faster during the winter than winter rye grew. Its grain yield was about the same as that of winter rye. Its kernels are variable in color and of medium size.

CULTURAL PRACTICES

Soil Preparation

Rye generally does better than other cereals on poorly prepared land. For best results, however, plant it in a firm, well-prepared seedbed.

The preparation of a seedbed for rye following a drilled crop depends on the soil moisture. In humid areas, prepare the seedbed by fall plowing followed by disking and harrowing. In semiarid sections, plowing and harrowing dries out the soil too much and it is better to sow the crop in stubble, if the land is clean; weeds can be troublesome in stubbled-in rye. If the land is weedy and is too dry to plow, do not plant rye; it is better to leave the land in stubble over winter.

In the Plains States, stubble mulch fallow is a better seedbed than clean summer fallow. If rye planted on clean summer fallow is winterkilled, the soil will be left unprotected and may be eroded by the wind. Stubble mulch will pro-

tect the soil if the rye is winter-killed.

Seedbed preparation is not necessary for rye following cotton, corn, or other intertilled crops. You can drill rye either before or after the intertilled crop is harvested. If the rye is planted before harvest, use a small drill between the rows, or sow the seed broadcast and cover it using a single-section harrow.

Seeding

Seed should be free of weeds and have at least 80-percent germination. Stored rye seed loses its ability to germinate more rapidly than do other cereals; test its germination before planting.

If possible, buy locally grown seed that has proved its adaptation to local conditions.

Rye seed generally is not treated for disease, although stands often can be improved greatly by seed treatment. Seed-treating applications used on other small grains are suitable for use on rye.

In States east of the Mississippi River and north of the Cotton Belt, the usual rate of seeding for grain

production is 6 pecks per acre. The rate for the Plains States is from 4 to 6 pecks per acre, and in the Cotton Belt the rate is from 2 to 4 pecks per acre.

Use about 2 bushels of seed per acre for pasture or for cover crop.

When you plant large-seeded varieties such as Tetra-Petkus, increase the seeding rate to allow for difference in kernel size.

Time of seeding depends on the use to be made of the crop. Sow winter rye for grain production at about the same time that winter wheat is sown. Sow rye for pasture, cover crop, or green-manure crop 2 to 8 weeks earlier than for a grain crop.

Sow spring rye as early as spring oats, or as early as it is possible to prepare the soil.

Rye generally is sown with a grain drill to a depth of 1 or 2 inches.

Fertilizing

Rye should be fertilized when it is grown for pasture or as a cover crop. Fall application of nitrogen and phosphorus increases fall growth, which improves winter ground cover. In the spring, soils that are low in organic matter should be top dressed with a high-analysis nitrogen fertilizer to replace the nutrients lost through winter leaching.

Do not use large amounts of nitrogen fertilizer if you are growing rye for grain; rye has a tendency to lodge. Manure, supplemented with phosphorus, is a good general fertilizer.

RYE IN WHEATFIELDS

It is not a good practice to grow rye between crops of wheat. Rye volunteers freely because considerable grain shatters before the crop is cut. Volunteer rye will reseed itself year after year. It will be harvested with the wheat and will lower the grade of the wheat.

For specific recommendations as to fertilizer formulations and rates of application for your area, consult your State agricultural experiment station or your county agricultural agent.

HARVESTING

Harvest rye the same way you harvest other small grains. Much rye is harvested and threshed in one operation with a combine. Some is cut with a binder and shocked in the field before threshing. In the Northern Plains, rye generally is swathed and later

threshed with a combine using a pickup attachment.

If the crop is left standing until it is dead ripe, there will be some loss from shattering. Swath before threshing to keep this loss at a minimum.

RYE FOR SOIL MANAGEMENT

Rotations

In rotations that include a small grain, rye may replace wheat, oats, or barley. A good place for rye in the rotation is after a cultivated crop such as corn or soybeans.

Rye is useful in the North in rotations designed to restrict or



TENN-03-290

Plowing under rye for green manure.



NJ-20479

Rye cover crop in an orchard. The crop protects soil from erosion, conserves plant nutrients, and removes excess water from the soil. It should be disked down in early spring.

eradicate noxious weeds. It is harvested early and the land then can be cultivated intensively. This intensive cultivation is aimed at killing troublesome perennial weeds such as quack grass, Canada thistle, and sow thistle.

Green Manure

Rye is particularly suitable as a green-manure crop because of its rank growth and its adaptation to low temperatures; it grows rapidly until late fall and resumes rapid growth in early spring.

To get the maximum amount of green manure from your crop, sow

it early, fertilize it in the fall, and top-dress it in the spring with a heavy application of nitrogen.

Turn rye under before it is fully mature; plants that are young and tender contain the most nitrogen. The most favorable time for turning rye under is from the time it is knee high until it begins to head. If you leave it standing until it is tall and coarse, apply nitrogen fertilizer when you turn it under. This will speed decomposition.

Turn it under at least 2 weeks before planting the next crop. If rye grows too late in the spring, it takes soil moisture that is needed by the next crop.

Cover Crop

Rye makes a good cover crop; it is winter hardy and vigorous. It protects soil against water and wind erosion and it reduces leaching of plant nutrients from the soil.

Seed your cover crop early in the fall to insure a heavy blanket of growth for protection of the soil over winter. Use only well-adapted varieties; excessive winter-killing or slow growth will reduce protection.

Rye as a cover crop fits well into many management programs. Land going into potatoes, tobacco, cotton, soybeans, or corn can be protected over winter by a rye cover crop.

Tests in Michigan show that potatoes following a green-manure crop of rye have less scab than potatoes following sweet clover or alfalfa.

In orchards, rye removes excess water from the soil, conserves nutrients, and checks erosion. In some regions, it helps to catch and hold snow. If rye is left in the orchard too late in the spring, however, it can reduce fruit yields.

You can use rye as an emergency cover to fill gaps between other crops. If you remove a crop early—because of failure, for instance—plant the land in rye to protect the soil until time to plant the next crop.

Companion Crop

Thin stands of rye may be used as a companion crop on soils in which wheat, oats, and barley will

not do well. Rye is grown with vetch in sandy areas of Nebraska, Kansas, and Missouri; it keeps the sand from blowing until the vetch becomes established. Vetch grown for seed often is grown with rye. The rye supports the vetch and makes it easier to combine. The two types of seed can be separated later.

You must be more careful in using rye as a companion crop than in using wheat, oats, or barley. It grows vigorously in the spring, and thick stands can deprive legume and grass seedlings of light, water, and nutrients. Sow the rye thinly and harvest it as soon as it is mature.

FEED FOR LIVESTOCK

Grain

As feed for livestock, rye grain is most satisfactory in mixtures with other grains; animals do not like the taste of rye by itself. The grain is similar to wheat in composition, but has slightly lower feeding value.

Trouble in feeding rye has been caused by overfeeding or by feeding grain that was partly spoiled or contained ergot.

Hay

The chief merits of rye as a hay crop are that it can be grown where other hay crops are not productive and it will produce early hay.

The hay is not of high quality. The stems are hairy and usually are coarse and tough. Livestock pre-

fer hay made from legumes or from the better grasses.

Cut for hay when the rye begins to head.

Silage

In the South Atlantic and East South Central States, rye has been used for silage. It has made excellent silage when combined with crimson clover and ryegrass. For best quality silage, cut rye just before the milk stage.

Pasture

In late fall and early spring, rye generally provides more forage than do other small grains or permanent pasture. During the period of rapid early growth, rye has a higher carrying capacity than wheat or oats.

Though rye is a less palatable pasture crop than wheat, oats, and most grasses, it is grazed readily when other green forage is not available. It usually is grazed more successfully in pure stands than in mixtures with other small grains, vetch, or clover. When it is grown in mixtures, the animals eat the tastier plants and leave the rye standing.

If you grow rye for a grain crop, you also can use it for pasture if you plant it early enough. Do not allow livestock to graze it too closely or too late in the fall. In the spring, let the rye grow 4 to 6 inches high before you turn livestock on it again. Be sure the land is not too wet; trampling by livestock can be injurious to rye on wet land. If growing conditions are

favorable, rye that is grazed moderately until near the heading stage still will yield a fair grain crop.

Southern-type ryes, which have an upright growth habit, make the best forage varieties. Abruzzi selections, Gator, and Balbo are the leading varieties used for grazing.

Rye may cause an undesirable flavor in milk. To avoid this, graze dairy cattle after milking and remove them from the rye pasture 3 or 4 hours before the next milking. Many dairy farmers say that Balbo does not impart as noticeable a flavor to milk as do other rye varieties.

INDUSTRIAL USES

Milling and Baking

As a source of flour for baking loaf bread, rye ranks next to wheat in commercial importance. Rye bread generally is darker and heavier than wheat bread.

The rye kernel is much softer than the kernel of most wheats; milling is simpler. Cleaning and separation processes are similar to those for wheat. Some millers have objected to Tetra-Petkus rye because milling machinery must be adjusted to handle the large kernels. When Tetra-Petkus is mixed with ordinary rye, the miller's problems are increased.

It is difficult to make quality comparisons between flours made from different varieties of rye. Varieties are not pure, and quality varies greatly with environment.

Distilling

Buyers for the distilling industry prefer rye grain that is high in test weight and free from foreign material. They desire large, plump seeds of uniform size; well-filled kernels contain more starch than shriveled or lightweight kernels and will produce more spirits.

Other Uses

Rye straw has several specialized commercial uses. It is desirable as packing for nursery trees and shrubs and as packing between layers of brick or tile. It is used in compost for mushroom growing. Archery targets are made from it.

DISEASES AND INSECT PESTS

Fewer diseases and insects attack rye than attack other cereals.

Ergot, the most serious disease of rye, causes severe losses. This disease is characterized by large purple-black bodies that replace some of the rye kernels in the head.

Ergot can be controlled by sowing ergot-free seed on land that has not been cropped to rye for at least 2 years. Ergot loses its viability after a year; if year-old seed is sown, there is little likelihood of infection.

Ergot is poisonous to humans and to livestock. It must be removed from rye grain that is to be used for feed or for milling. You can separate some of the purple-black bodies by screening, but the most dependable method of separation is to soak the seed in a solution containing 20 percent of salt.



BN-8384-X

Ergot in heads of rye. The purple-black fruiting bodies replace grain in the rye head.

Skim off the ergot bodies, which float to the top. Wash and dry the seed after the salt treatment.

Stem rust and leaf rust attack rye but are not serious because crops usually mature before the damage becomes significant. Stem smut can be destructive to rye, but rarely occurs.

Anthrachnose causes stunted growth and premature ripening of the rye plant. It is particularly severe in the East South Central and South Atlantic States.

Minor diseases of rye include

loose smut and stem blight. Tests made in California indicate that rye is resistant to yellow-dwarf virus, which attacks barley, oats, and wheat in that area.

Some of the same insects that feed on other small grains also attack rye. Insect pests include chinch bugs, grasshoppers, the greenbug, and the wheat stem saw-

fly. Rye is not as badly infested by the hessian fly as is wheat. The granary weevil and the Angoumois moth can be very destructive to stored grain.

For information on disease and insect control in your area, write to your State agricultural experiment station or ask your county agricultural agent.